

Bell Work
19/20-Nov-2013

a) What is the name of $\text{Al}(\text{OH})_3$?

b) What is the law of conservation of mass?

c) What are the two sides of a chemical equation called?

Objective: You will be able to identify the three (3) of the five (5) different types of chemical rxns and predict products



Types of Reactions

There are five types of chemical reactions we will talk about for now:

1. **Synthesis rxns**
2. **Decomposition rxns**
3. **Single displacement rxns**
4. **Double displacement rxns**
5. **Combustion rxns**

You need to be able to identify the type of reaction and predict the product(s)

Steps to Writing Reactions

Some steps for doing reactions

- 1. Identify the type of reaction (rxn)**
- 2. Predict the product(s) using the type of rxn as a model**
- 3. Balance it***

Don't forget about the diatomic elements!

1. Synthesis Rxns

Synthesis reactions occur when two substances (generally elements) combine and form a compound.

reactant + reactant \rightarrow 1 product

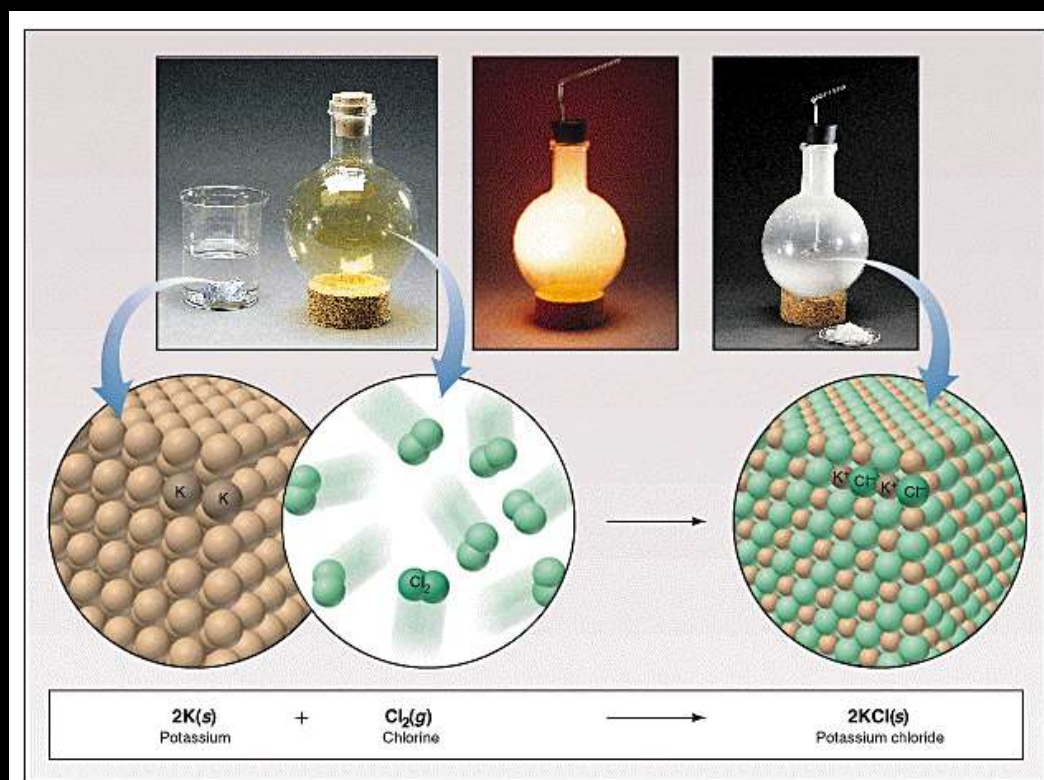
Basically: $A + B \rightarrow AB$

Example: $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

Example: $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$

Synthesis Rxns

Here is another example of a synthesis reaction



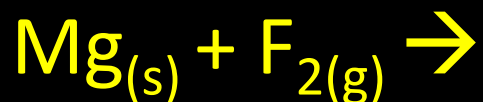
Practice

Predict the products. Write and balance the following synthesis reaction equations.

Sodium metal reacts with chlorine gas



Solid Magnesium reacts with fluorine gas



Aluminum metal reacts with fluorine gas



2. Decomposition Rxns

Decomposition reactions occur when a compound breaks up into the elements or in a few to simpler compounds

1 Reactant \rightarrow Product + Product

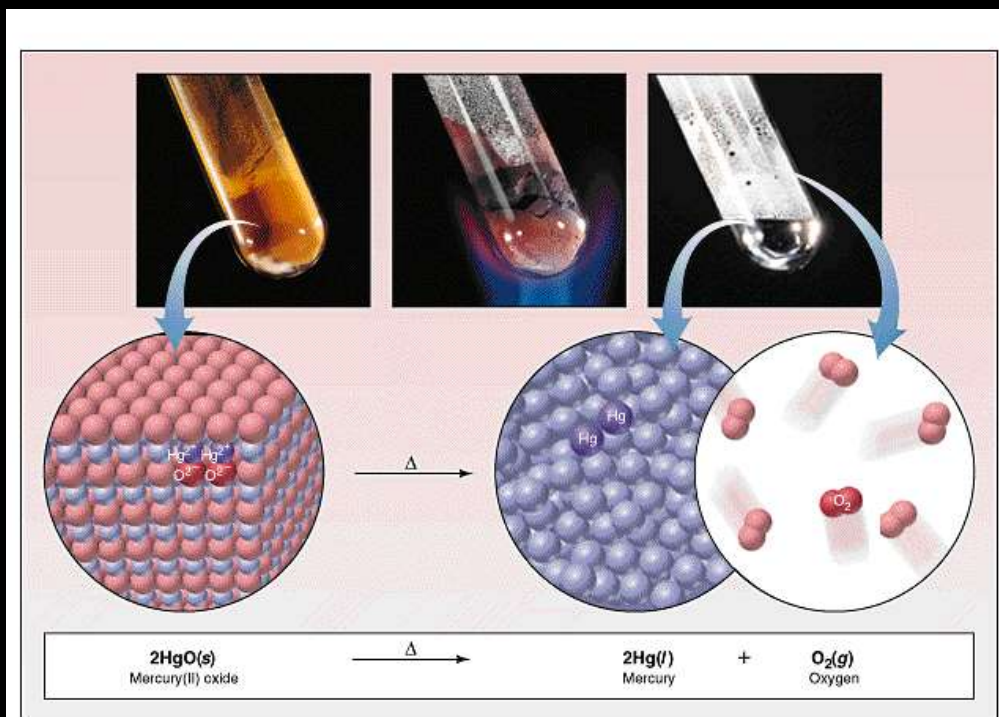
In general: $AB \rightarrow A + B$

Example: $2 \text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$

Example: $2 \text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$

Decomposition Rxns

Another view of a decomposition reaction:



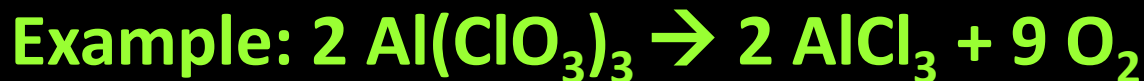
Decomposition Exceptions

Carbonates and chlorates are special case decomposition rxns that do not go to the elements.

Carbonates (CO_3^{2-}) decompose to carbon dioxide and a metal oxide



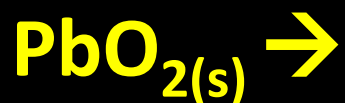
Chlorates (ClO_3^-) decompose to oxygen gas and a metal chloride



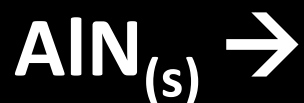
Practice

Predict the products. Then, write and balance the following decomposition reaction equations:

Solid Lead (IV) oxide decomposes



Aluminum nitride decomposes

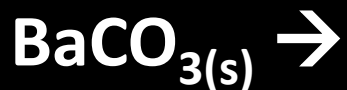


Practice

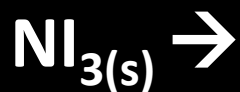
Identify the type of rxn for each of the following synthesis or decomposition rxns, and write the balanced equation:



Nitrogen monoxide



(Use Cobalt (III))



Reaction Type Practice

If you combine 1 cup of hot water with 1 packet of hot chocolate you get one cup of hot cocoa.

Write a balanced equation depicting this and give the reaction type.

Reaction Type Lab: Pre-AP

Pre lab questions:

1.

2.

3.

Reaction Type Lab: Pre-AP

What are two safety concerns?

Where should all waste be disposed?

Once done with Cu wire, clean completely off with steel wool and return to Cu wire beaker (make sure it is shiny)

Homework
19/20-Nov-2013

Read p. 228-230 and #13-22

Bell Work:

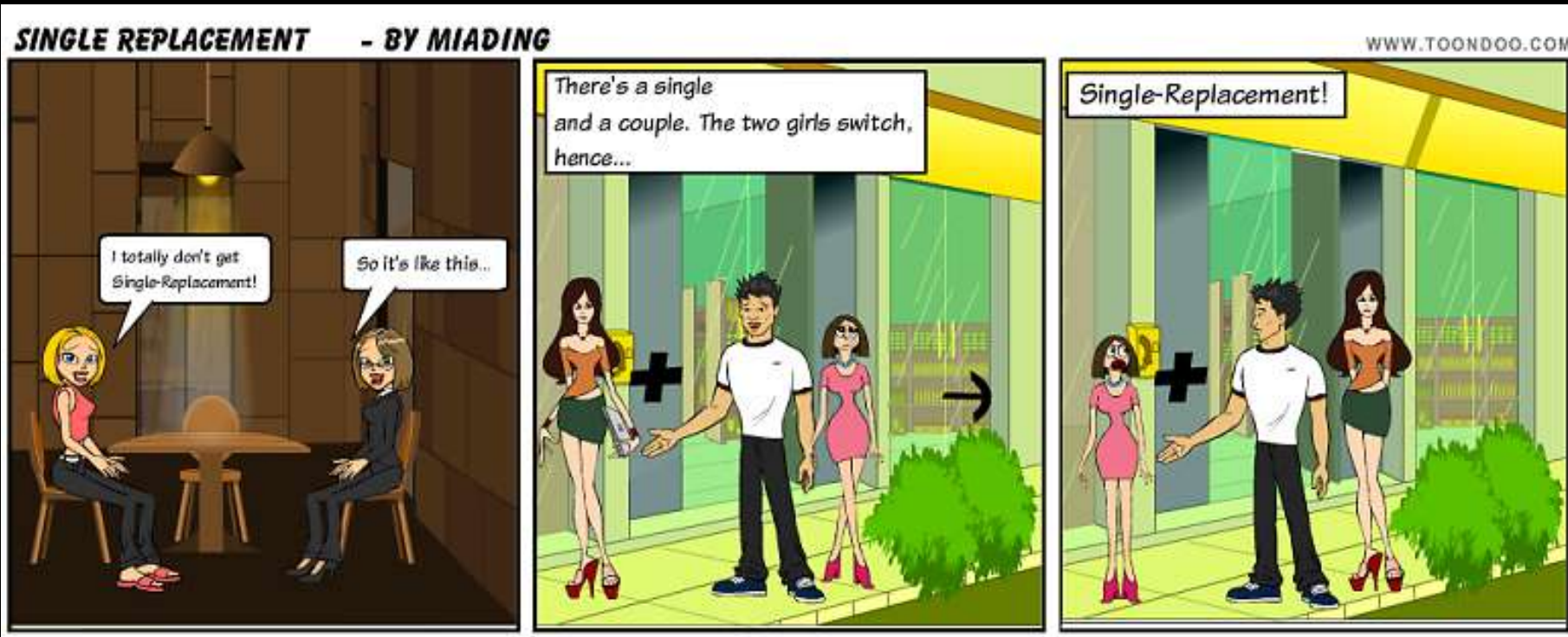
21-Nov-13

- a. If MgCO_3 is heated to decomposition, what are the two (2) products?
- b. Can you write a chemical equation for this?
- c. Balance it now!



Objective: You will be able to identify the last two (2) more of the five (5) different types of chemical rxns and predict products based on this knowledge.

Turn In: Nomenclature Flow Chart



3. Single Displacement Rxns

Single Replacement Reactions occur when one element replaces another in a compound.

A metal can replace a metal (+) OR
a nonmetal can replace a nonmetal (-).

element + compound \rightarrow product + product

A + BC \rightarrow AC + B (if A is a metal) OR

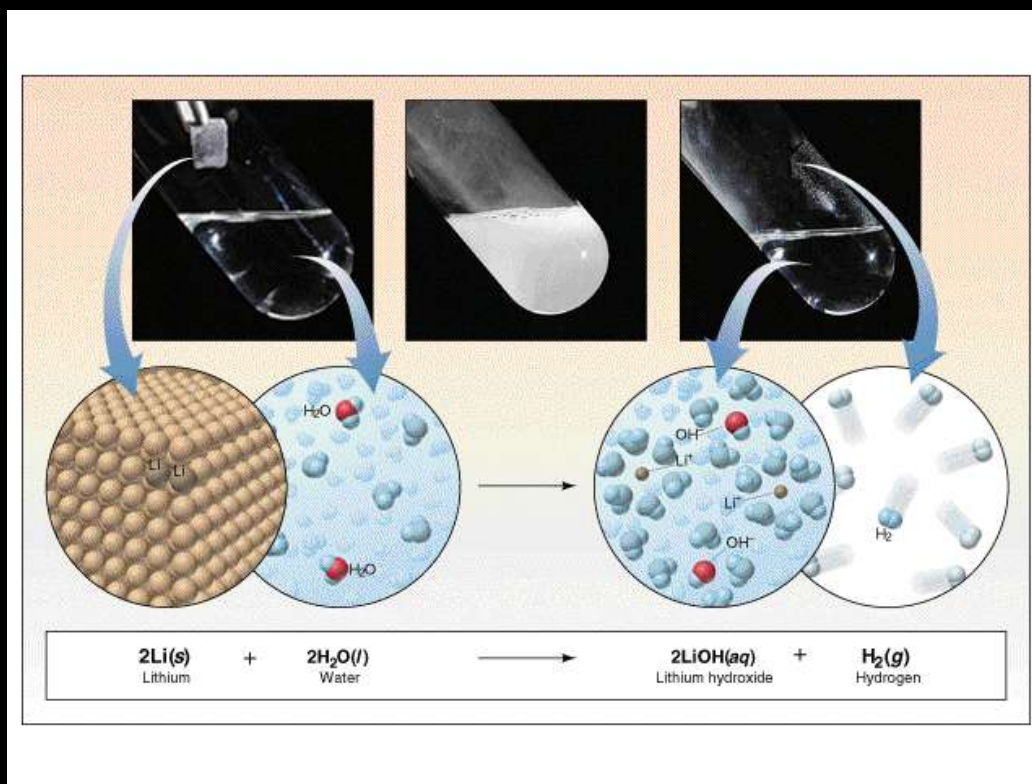
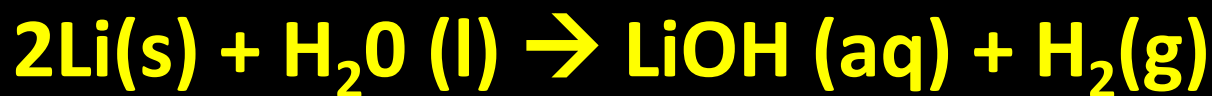
A + BC \rightarrow BA + C (if A is a nonmetal)

remember the cation always goes first!)

**When H₂O splits into ions, it splits into
H⁺ and OH⁻ (not H⁺ and O⁻² !!)**

Single Displacement Rxns

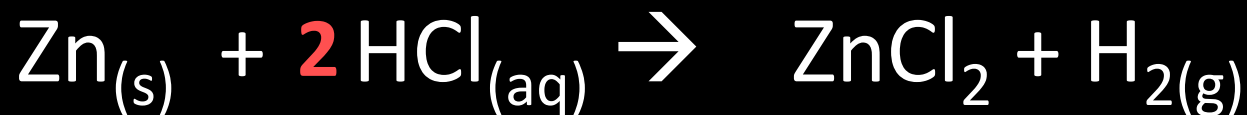
Another view:



Single Displacement Rxns

Write and balance the following single replacement reaction equation:

Zinc metal reacts with aqueous
hydrochloric acid



Note: Zinc replaces the hydrogen ion in the reaction

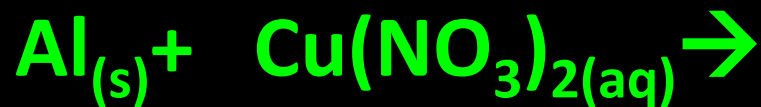
Single Displacement Rxns

Sodium chloride solid reacts with fluorine gas



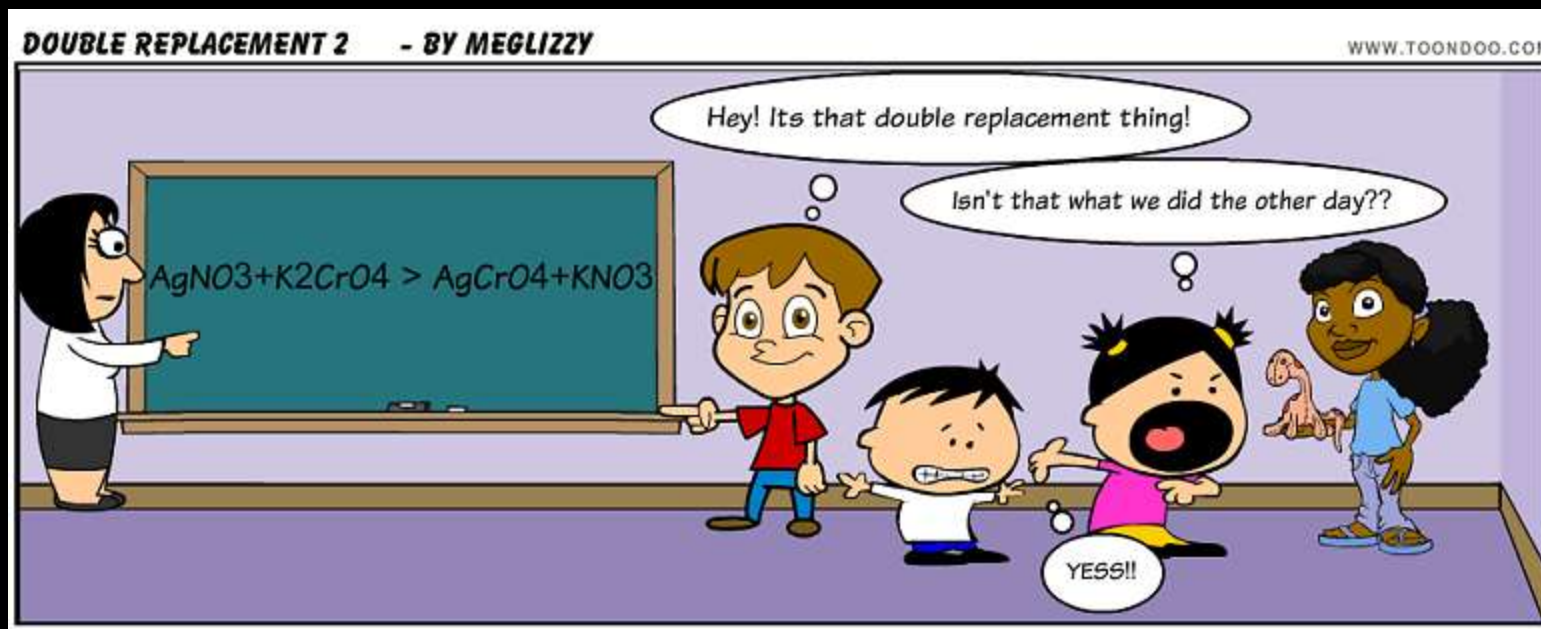
Note that fluorine replaces chlorine in the compound

Aluminum metal reacts with aqueous copper (II) nitrate...



4. Double Displacement Rxns

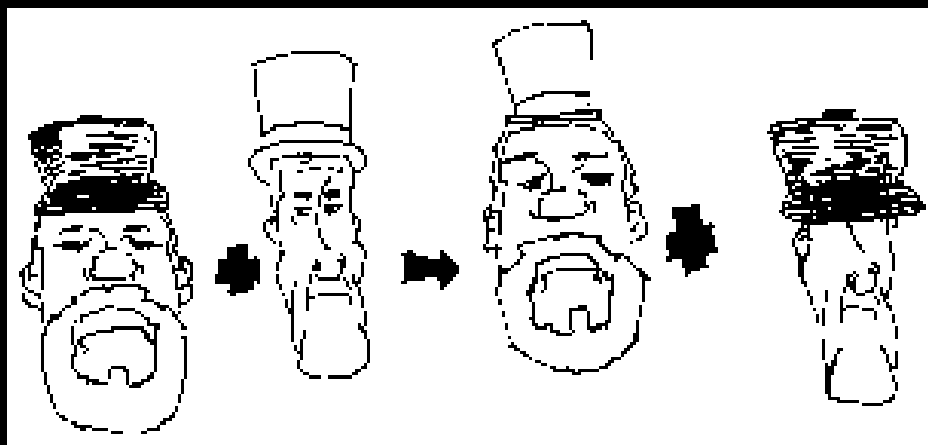
Compound + compound \rightarrow product + product



4. *Double Displacement Rxns*

Double Replacement Rxns occur when a metal replaces a metal in a compound and a nonmetal replaces a nonmetal in a compound

Compound + compound \rightarrow product + product



Double Displacement Rxns

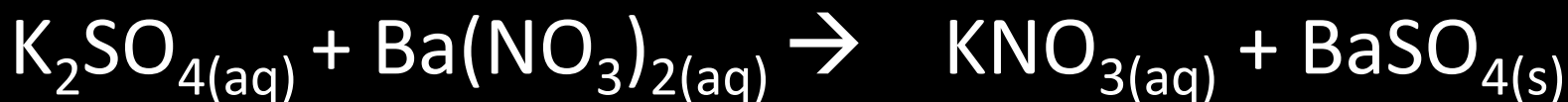
<http://youtu.be/57gfvzePCtA>

Think about it like “foil”ing in algebra, first and last ions go together + inside ions go together

Example:

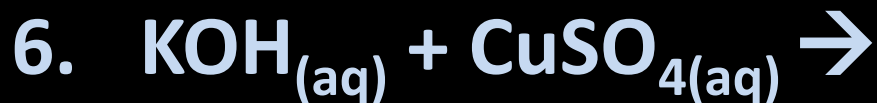
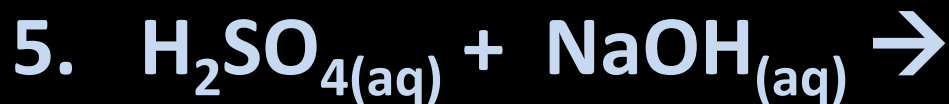
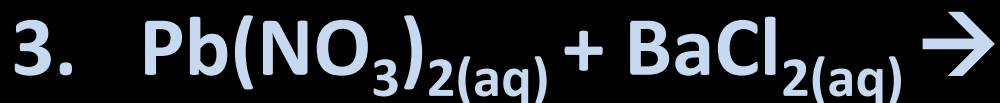
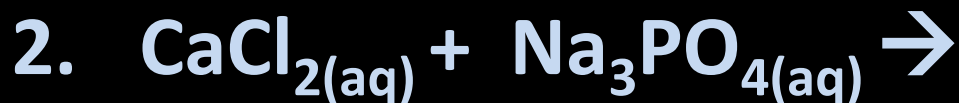


Another example:



Practice

Predict the products. Balance the equation



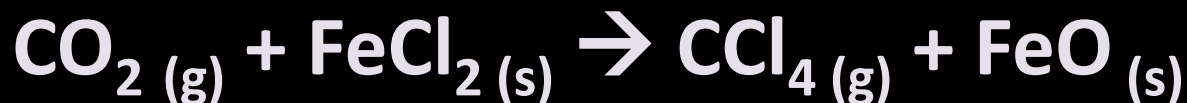
Finish Post lab!

Reaction type

Reaction Type	Observations Before Reaction (physical properties):	Observations After Reaction:
A		
B		
C		
D		

Before you go

Balance Me



What type of rxn is this?

Name each of the compounds?

5. Combustion Rxns

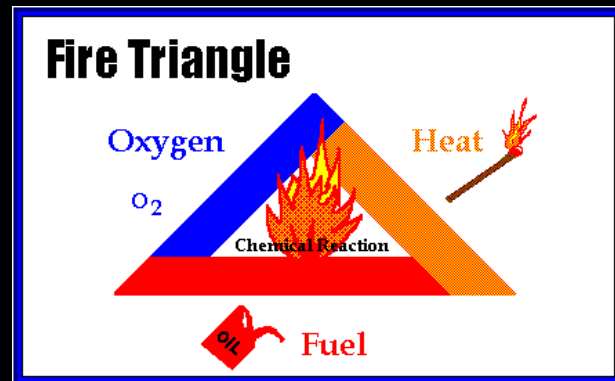
Combustion reactions occur when a hydrocarbon reacts with oxygen gas.

This is also called burning!!! You need three (3) things

A Fuel (hydrocarbon)

Oxygen (O_2) to burn it with

Something to ignite the rxn (spark)



Review Practice

Copper (II)carbonate → Copper (II)oxide +
Carbon dioxide

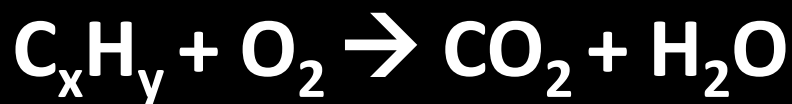
Sodium oxide + Water → Sodium hydroxide



Combustion Rxns



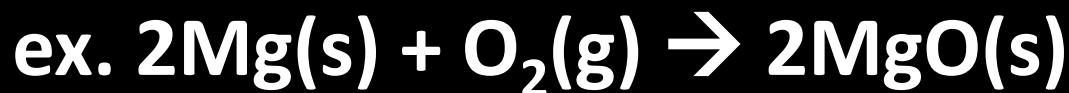
In general:



Products in combustion are **CO₂** and **H₂O**.

(although incomplete burning does cause some by-products like CO)

Exception: when combusting a non hydrocarbon



Combustion

Example

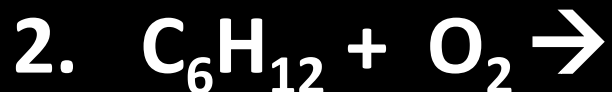


Write the products and balance the following combustion reaction:



Mixed Practice

State the type, predict the products, and balance the following rxns:



Objective

You will see various reaction types in the lab

The first 2 Rxn types

What where the first two reaction types...

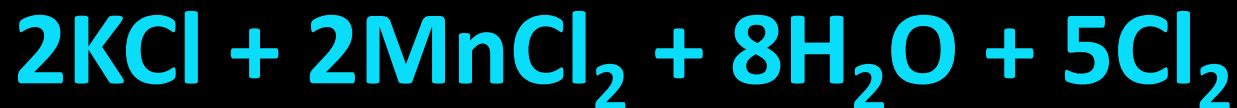
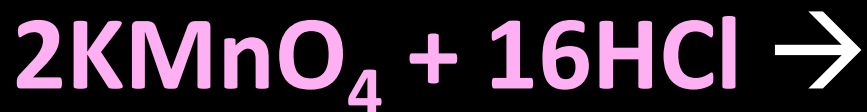
Bell Work

25-Nov-2013

On a new BW # 10

Grab a computer turn it on.

Do the number of atoms on each side
match up?



Objective

You will UNDERSTAND the basic components of a chemical equation and begin to see how to balance them using an online balancer

CHEMICAL REACTIONS



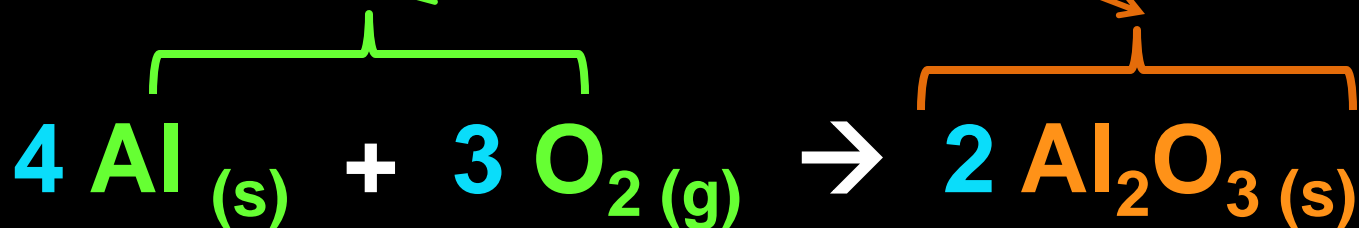
Reactants: $\text{Zn} + \text{I}_2$



Product: Zn I_2

Chemical Equations

Their Job: Depict the kind of **reactants** and **products** and their relative amounts in a reaction.



The **numbers in the front** are called coefficients

Chemical Reaction

A process in which at least one new substance is produced as a result of chemical change.



Steps to Balancing Equations

There are four basic steps to balancing a chemical equation.

1. Write the correct formula for the reactants & the products.

DO NOT TRY TO BALANCE IT YET!

DO NOT CHANGE THE FORMULAS!

2. Find the number of atoms for each element on the left side. Compare those against the atoms on the right side.

Steps to Balancing Equations

3. Determine what coefficients to place in front of formulas so that the left side has the same # of atoms as the right side for *EACH* element in order to balance the equation.

4. Check your answer to see if:

-The numbers of atoms on both sides of the equation are now balanced.

-The coefficients are in the lowest possible whole number ratios.

(reduced)

Coefficients

Is a number in front of a variable, in chemistry it is the number in front of a compound or ion in a balance equations.






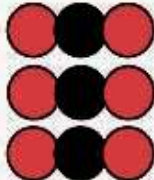
2 H₂O mean: you have H₂O, H₂O or 4H and 2 O

What does 3PO₃ mean?

Subscripts vs. Coefficients

The coefficient tells you about the quantity, or number, of molecules of the compound.

The subscripts tell you how many atoms of a particular element are in a compound.

C	means		One atom of carbon
O	means		One atom of oxygen
O ₂	means		One molecule of oxygen consisting of two atoms of oxygen
CO	means		One molecule of carbon monoxide consisting of one atom of carbon attached to one atom of oxygen
CO ₂	means		One molecule of carbon dioxide consisting of one atom of carbon attached to two atoms of oxygen
3 CO ₂	means		Three molecules of carbon dioxide, each consisting of one atom of carbon attached to two atoms of oxygen

“On line Chem Balancer”

Go to: Class web page under homework sections and open the “Online Balancing Chemical Equations Practice pdf. File”

Or

Go to P drive Golden, Pre-AP and open file from there

“Homework

Balancing Equations Practice

On a separate sheet of Paper!

Pre-AP: #1-15 and 51-55

Bell Work

26-Nov-2013

What must a balanced equation have (two things)?

What type of rxn is this?



Predict the products and balance.

Name the Products

Agenda

Objective

You will KNOW how to balance a chemical equation through practice of the inspection method

Symbols Used in Equations

Solid s

Liquid (l)

Gas g

Aqueous solution (aq)

Catalyst $\xrightarrow{\text{H}_2\text{SO}_4}$

Chemical Equations

Because of the principle of the **conservation of matter**, an **equation must be balanced.**

It must have the same number of atoms of the same kind on both sides.

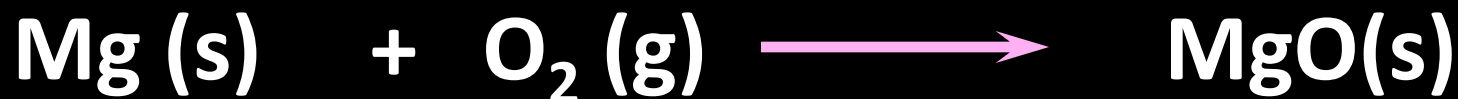


Writing a Chemical Equation

Chemical symbols give a “before-and-after” picture of a chemical reaction

Reactants

Product



magnesium

to form

reacts with Oxygen

Magnesium Oxide

Reading A Chemical Equation



Four molecules of NH_3 react with **five** molecules O_2 **to produce** four molecules NO and six molecules of H_2O

or

Four moles NH_3 react with 5 moles O_2 **to produce** four moles NO and six moles H_2O

Chemical Equations



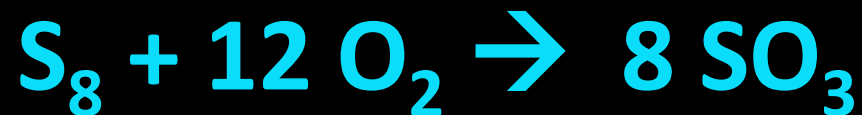
This equation means

4 Al atoms reacts with 3 O₂ molecules **to**
produces 2 molecules of Al₂O₃

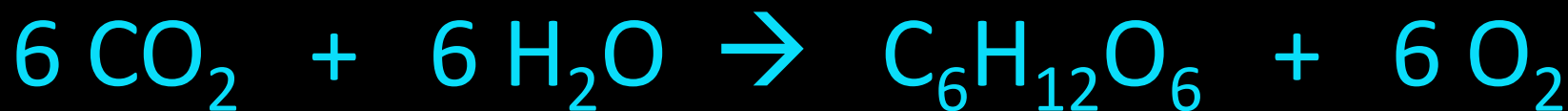
OR

4 Al moles reacts with 3 O₂ moles **to produces**
2 moles of Al₂O₃

Chemical Equations



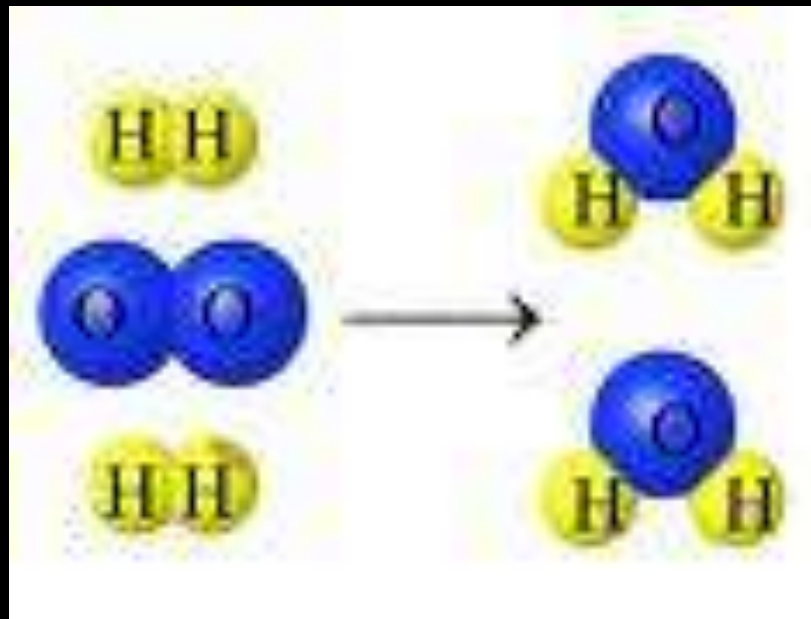
This equation means



This equation means

Law of Conservation of Mass

In any ordinary chemical reaction, matter is not created nor destroyed

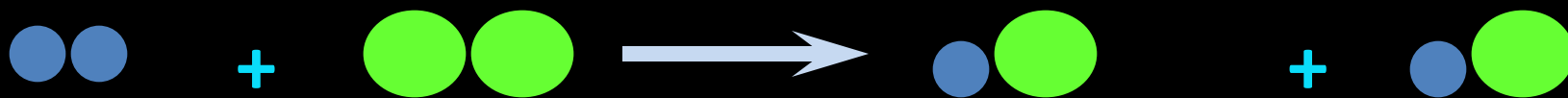
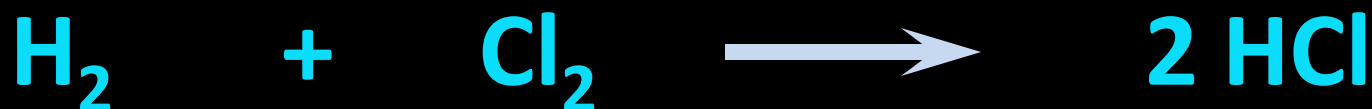


A Balanced Chemical Equation

Same numbers of each type of atom on each side of the equation



Matter Is Conserved



Total atoms

=

Total atoms

2 H, 2 Cl

2H, 2 Cl

Total Mass

=

Total Mass

2(1.0) + 2(35.5)

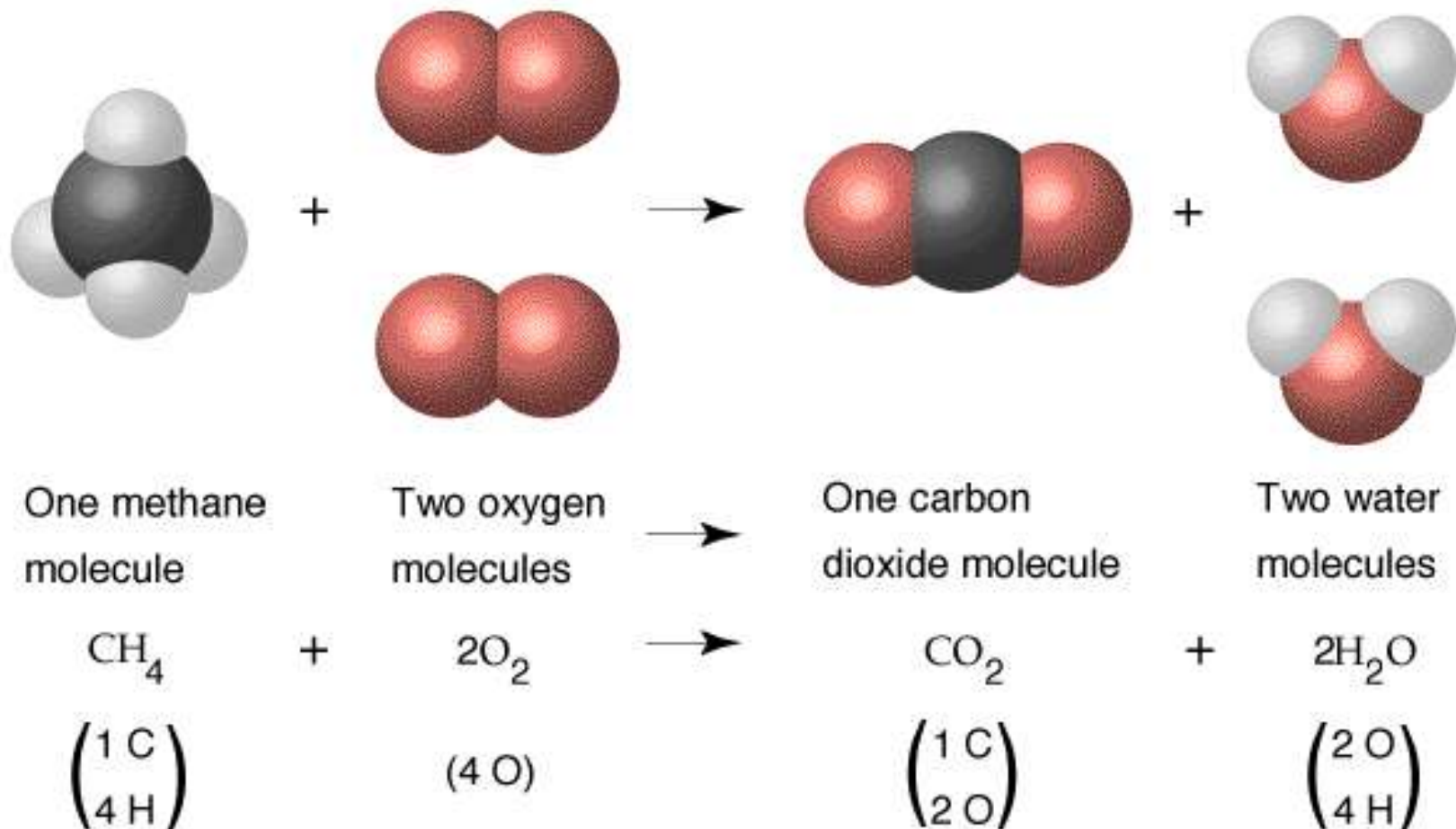
2(36.5)

73.0 g

=

73.0 g

Matter Is Conserved



Pre Lab

“Types of Chemical Rxns, Balancing Equations, and more!”

Pre-lab for Mini Lab 1, then start Mini-lab 1: Penny and HCl (set up on day 1): Steps 1-5

You need to have goggles on, use one small beaker per Lab bench, and mark names with masking tape. Place in class spot for overnight storage

Use 20ml 3.0M HCl per 1 penny caution

Types of Chemical Rxns, balancing Equations, and More

Mini labs 2 : Will be done as a class

Iron wire (Fe) + 0.5g of CuCl_2

Before using it make sure it fits in the test tube rack for overnight storage and label it with name and period

No need to mix with a glass stir rod, just swirl until mixed

Reactant	Mass _i		Product	Mass _f
Fe	0.48g		Solid	0.53g
CuCl_2	0.51g		aqueous	
Total Mass			Total Mass	

Types of Chemical Rxns, balancing Equations, and More

Mini labs 3: Will be done as a class

Follow proper procedures

Zn strips have been replaced by Zn castings

Use SMALL test tubes and make sure they fit into the test tube rack, make sure they are labeled with name and period

AgNO_3 will stain your clothes and your skin!!!

Solution/wire	Mass of wire before putting it in solution	Color of each solution after reacting with the wire	Description of what happened to the wire or the strip- what did the reaction look like?	Mass of the wire after the "stuff" was removed from it
$\text{AgNO}_3 + \text{Cu}$	0.20g			
$\text{Pb}(\text{NO}_3)_2 + \text{Zn}$	0.25g			

Homework

26-Nov-2013

Complete #16-40 on Balancing Equations
practice

Balance Equations with Coefficients

Coefficients *in front* of formulas balance each type of atom



4 N = 4 N

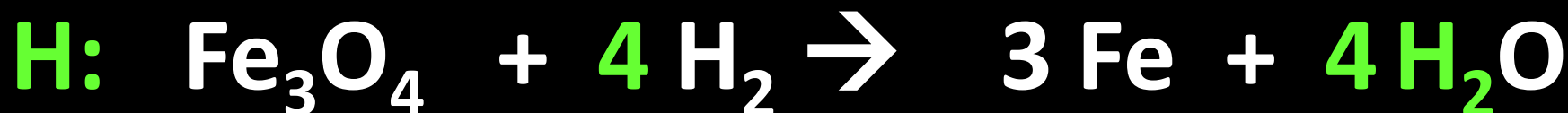
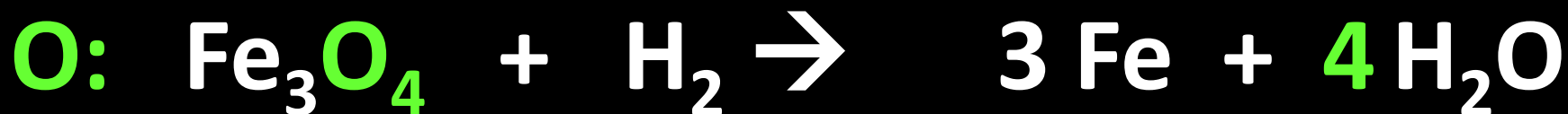
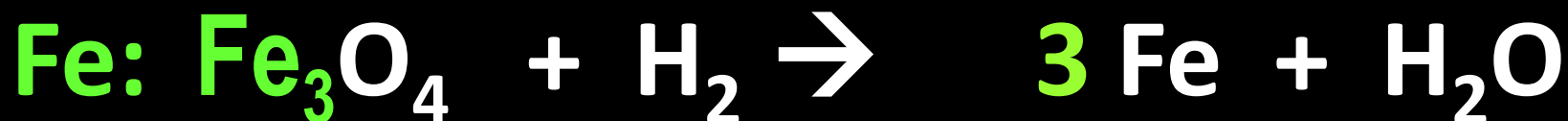
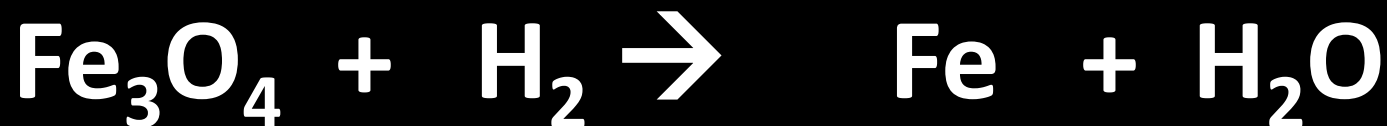
12 H = 12 H

10 O = 10 O

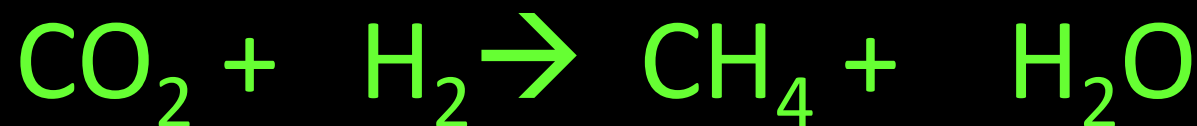
Balancing Equations



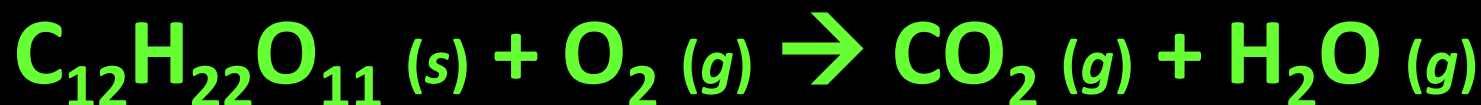
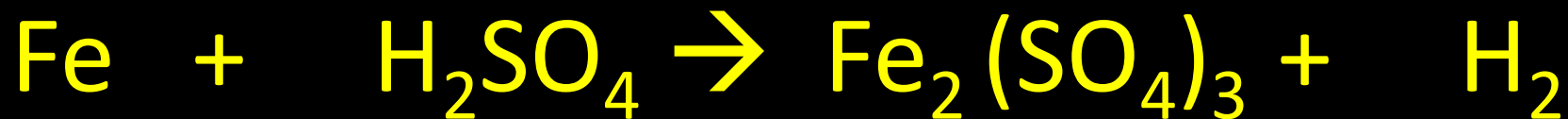
Steps in Balancing An Equation



You Try



You Try



Bell Work

27-Nov-2013

Balance the following equation:



What is the molar ratio of Zn: ZnCl₂

Think you can...

If you have 32g (65g/1mol) of Zn, how many moles of Zn are there?

Balancing Equations

Do Not Give Up!



Objective

You will be able to identify all of the reaction types and know what a mole is.

Mini Lab 1: Penny and HCl

[illegible]

A check list to help



Follow this series of questions. When you can answer "yes" to a question, then stop!

- 1) Does your rxn have oxygen as one of its reactants and carbon dioxide and water as products? If yes, then combustion rxn
- 2) Does your rxn have two (or more) chemicals combining to form one chemical? If yes, then it's synthesis rxn

A check list to help Cont.



Follow this series of questions. When you can answer "yes" to a question, then stop!

- 1) Does your rxn have oxygen as one of it's reactants and carbon dioxide and water as products? If yes, then it's combustion rxn
- 2) Does your rxn have two (or more) chemicals combining to form one chemical? If yes, then it's synthesis rxn
- 3) Does your rxn have one large molecule falling apart to make several small ones? If yes, then it's a decomposition rxn
- 4) Does your rxn have any molecules that contain only one element? If yes, then it's a single displacement rxn
- 5) If you haven't answered "yes" to any of the questions above, then you've got a double displacement rxn

Turn In

1. Reaction Type lab

Homework

Finish Balancing equation work sheet
through #60

Practice

Write at least two example of each type of rxn on a separate sheet of paper. You will exchange it with another student to complete.

Ex.

Sodium Chloride reacts with Potassium



Magnesium hydroxide reacts with Lithium Fluoride



Before you Go

Write a balanced equation and tell the reaction type.

Sodium Chlorate is heated to produce...

Lead (IV) Sulfate and Iron (III) Chloride react to produce...

Bell Work

2-Dec-2013

Write out the products, ions first, for the following rxn:

Ammonium Carbonate is reacted with Barium nitrate.

Write out the ions for all species in the reaction.

EQ:

Why do some interact while others do not?

Objective:

You will be able to write a response to a prompt better than before

Turn In
2-Dec-2013

-Online chemical Balancing

-Balancing equation Practice #1-60

Bell Work

3-Dec-2013

**How is the naming of ionic compound
(representative and transition metals)
different than covalent?**

What is a precipitate?

What does “aq” tell you?

Total Ionic Equations

Once you write the molecular equation (synthesis, decomposition, etc.), you should check for reactants & products that are soluble or insoluble.

Assume the reaction is in water

We can use a solubility table to tell us what compounds dissolve in water.

If the compound is soluble (does dissolve in water), then splits the compound into its component ions

If the compound is insoluble (does NOT dissolve in water), then it remains as a compound

Solubility Table

<u>Ion</u>	<u>Solubility</u>	<u>Exceptions</u>
NO_3^-	soluble	none
ClO_4^-	soluble	none
Cl^-	soluble	except Ag^+ , Hg_2^{2+} , $^*\text{Pb}^{2+}$
I^-	soluble	except Ag^+ , Hg_2^{2+} , Pb^{2+}
SO_4^{2-}	soluble	except Ca^{2+} , Ba^{2+} , Sr^{2+} , Hg^{2+} , Pb^{2+} , Ag^+
CO_3^{2-}	insoluble	except Group IA and NH_4^+
PO_4^{3-}	insoluble	except Group IA and NH_4^+
-OH	insoluble	except Group IA, $^*\text{Ca}^{2+}$, Ba^{2+} , Sr^{2+}
S^{2-}	insoluble	except Group IA, IIA and NH_4^+
Na^+	soluble	none
NH_4^+	soluble	none
K^+	soluble	none

*slightly soluble

Solubilities Not on the Table!

Gases only slightly dissolve in water

Strong acids and bases dissolve in water

- Hydrochloric, Hydrobromic, Hydroiodic, Nitric, Sulfuric, Perchloric Acids
- Group I hydroxides (should be on your chart anyway)

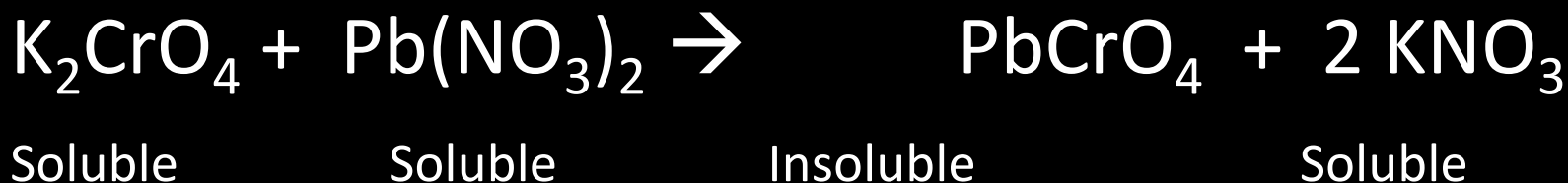
Water slightly dissolves in water! (H^+ and OH^-)

There are other tables and rules than your table!



Total Ionic Equations

Molecular Equation:



Total Ionic Equation:



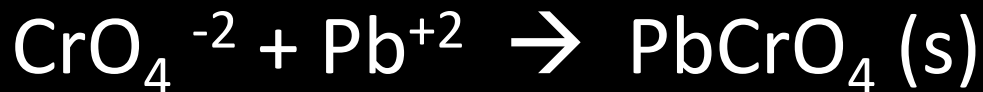
Net Ionic Equations

These are the same as total ionic equations, but you should cancel out ions that appear on BOTH sides of the equation

Total Ionic Equation:



Net Ionic Equation:



Net Ionic Equations

Try this one! Write the molecular, total ionic, and net ionic equations for this reaction: Ammonium Chloride reacts with Lead (II) Nitrate in hot water.

Molecular:

Total Ionic:

Net Ionic: